

**POLLUTION PREVENTION**  
**PROGRAM PLAN**  
**for**  
**ARGONNE NATIONAL LABORATORY - EAST**

April 1997

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## EXECUTIVE SUMMARY

This Plan is written to fulfill the requirements of DOE Order 5400.1, *General Environmental Protection Program*, the Secretary of Energy's Pollution Prevention Goals from DOE's 1996 Pollution Prevention Program Plan, and guidance supplied by the Environmental Management Office of Pollution Prevention (EM-77).<sup>1</sup> The Secretary has outlined seven pollution prevention goals to be achieved by December 31, 1999. EM-77 has prepared an activity plan comprising 18 activities that are to be used as a guide to achieve these goals. The purpose of the plan is to define the activities Argonne National Laboratory - East (ANL-East) will implement to achieve the Secretary of Energy's pollution prevention goals.

The Secretary of Energy's seven pollution prevention goals to be achieved by December 31, 1999, are:

1. Reduce the generation of low-level waste (LLW) by 50%,
2. Reduce the generation of mixed waste by 50%,
3. Reduce the generation of hazardous and state-regulated waste by 50%,
4. Reduce the generation of sanitary waste by 33%,
5. Reduce the treatment and disposal of SARA 313 chemicals by 50%,
6. Increase recycling of sanitary waste to 33% annually, and
7. Increase procurement of EPA designated recycled goods to 100%.

Calendar Year 1993 is used as the baseline year for these seven goals.

The Laboratory has two basic types of waste streams: (1) those originating in research and development (R&D), and (2) those coming from laboratory operations, environmental restoration, and decontamination and decommissioning (D&D) activities. The R&D generated wastes will be reduced by increasing awareness, training, and involvement within the research community. The operational wastes will be reduced by addressing major waste streams individually during the project planning phase.

The Laboratory's strategy for reducing LLW generation by 50% includes the implementation of the following initiatives: improved waste segregation and classification methods, depletion of the remaining balance of historic LLW, source reduction, reduction of potential waste materials entering contaminated areas, and the sorting, shredding, and compacting of LLW.

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<sup>1</sup>Memorandum for Heads of Headquarters Elements, Operations and Field Office Managers, from T.P. Grumbly, subject: Guidance for Preparation of Site Pollution Prevention Plans, February 27, 1997.

The goal to reduce the generation of mixed waste by 50% will be met by a combination of on-site treatment, source substitution, and waste stream reduction that is occurring within ANL-East's current operations.

The sanitary waste goal will be met by fully implementing the Mixed Office Paper Pilot (MOPP) Program and continuously assessing and improving other existing Laboratory recycling programs (e.g., scrap metal, wooden pallets, and computer components). Programs to increase awareness and promote alternatives to waste generation will provide additional support to the recycling programs.

The hazardous waste and the treatment and disposal of SARA 313 chemicals goals are attainable at ANL-East. By eliminating the use of high sulfur coal at the boiler house, and implementing a program to replace chlorofluorocarbons (CFCs), the Laboratory has positioned itself to achieve these goals.

The goal to increase procurement of EPA designated recyclables to 100% will be the most difficult to meet. Although the goal has contingencies for cost effectiveness and quality (usability), there are rigorous requirements for documenting that a product does not meet specifications or is not cost effective. The goal implies 100% implementation. This goal will be addressed through a combination of an Affirmative Procurement Awareness Program, the development of an upgraded procurement tracking system, and the development and execution of Laboratory-wide recycled product procurement procedures.

The cost of the pollution prevention program is estimated to be \$680K in FY98 and \$1,000K in FY99.

## 1 INTRODUCTION

This Plan is required by DOE Order 5400.1, *General Environmental Protection Program*. Guidance for the contents of this Plan originate in DOE's *Pollution Prevention Program Plan of 1996* (DOE/S-0118),<sup>1</sup> and guidance received from the Environmental Management Office of Pollution Prevention (EM-77).<sup>2</sup> This Plan will combine the original ANL-East Pollution Prevention Awareness Plan, and ANL-East Pollution Prevention Program Plan, with the guidance developed in DOE's Pollution Prevention Program Plan, and requirements of the Secretary of Energy's Pollution Prevention Goals. The product of this effort is a single document that describes activities Argonne National Laboratory-East (ANL-East) will use to achieve the Secretary of Energy's goals and pollution prevention programmatic objectives.

ANL-East currently uses five programmatic documents to guide the pollution prevention program: (1) ANL-East Waste Minimization and Pollution Prevention Strategic Plan, (2) ANL-East Pollution Prevention Awareness Plan, (3) ANL-East Pollution Prevention Program Plan, (4) a Current Year Work Plan, and (5) an annual Waste Minimization and Pollution Prevention Implementation Plan. In 1994, the ANL-East Pollution Prevention Awareness Plan and ANL-E Pollution Prevention Program Plan were written to comply with DOE Order 5400.1. During 1995, ANL-East wrote its own Waste Minimization and Pollution Prevention Strategic Plan, and a corresponding annual Waste Minimization and Pollution Prevention Implementation Plan. The Current Year Work Plan (CYWP) is written to describe annual EM-77 funded activities. ANL-East's intent is to simplify documentation by reducing the number of planning documents, in concert with DOE.

The intent of the ANL-East Pollution Prevention Plan is to provide a pollution prevention strategy for the ANL-East site. Individual facilities and programs within the ANL-East organization will subscribe to and function under the guidance and direction provided in this Plan. This Plan places primary emphasis on newly generated and routinely generated waste. A secondary emphasis is attached to environmental restoration, decontamination & decommissioning (D&D), and facility restoration activities, because these activities are specifically excluded from the Secretary's goals.

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<sup>1</sup>Pollution Prevention Program Plan, 1996, DOE/S-0118, U.S. Department of Energy, Office of the Secretary, Washington, DC 20585.

<sup>2</sup>Memorandum for Heads of Headquarters Elements, Operations and Field Office Managers, from T.P. Grumbly, subject: Guidance for Preparation of Site Pollution Prevention Plans, February 27, 1997.

## 1.1 DESCRIPTION OF ANL-EAST SITE<sup>3</sup>

ANL-East is a large multi-program laboratory operated by the University of Chicago for the U.S. Department of Energy (DOE). The Laboratory's mission is basic research and technology development to meet national goals in energy technology, environmental quality, scientific leadership, and educational infrastructure. To accomplish its mission for the DOE and the nation, ANL-East continually strives to improve its leading-edge capabilities in science and engineering, with emphasis on its recognized core competencies.

## 1.2 MISSION AREAS

ANL-East's major mission areas are the following:

- *Fundamental Science*

Experimental and theoretical work in the physical, life, and environmental sciences to support the development of energy and environmental technologies and to advance general scientific understanding. Major research thrusts include advanced techniques for X-ray and neutron science, algorithms and tools for massively parallel computers, studies of the human genome, synthesis of advanced materials, detector systems for frontier experiments in particle physics, and studies of nuclear structure far from stability.

- *National Research Facilities*

Development and operation of national facilities for use by university, industry, and national groups in research on technology-related and basic-science problems; development of advanced instruments and methods for facilities-centered research. Major national user facilities currently operated by ANL-East include the **Advanced Photon Source**, the **Intense Pulsed Neutron Source**, and the **Argonne Tandem-Linac Accelerator System**. The Advanced Photon Source is the world's most brilliant source of X-rays for forefront research in technology and science.

- *Energy Technologies*

Advanced nuclear technologies supporting civilian nuclear power; technologies for efficient energy utilization in the transportation and industrial

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<sup>3</sup>Argonne National Laboratory, Institutional Plan FY 1997-2002, October 1996.

sectors, for energy storage, and for fossil energy; supporting research in materials, chemical, and electrochemical technologies. The Laboratory's capabilities in these areas are focused on the safety and efficiency of light-water nuclear reactors; international nuclear safety; energy efficiency, through the Partnership for a new Generation of Vehicles and the Industries of the Future initiatives; advanced batteries and fuel cells; high and low-temperature superconducting materials and their applications; and advanced fossil fuel conversion technology.

- *Environmental Technologies*

Technology for nuclear waste management, nuclear D&D, industrial waste management, and site restoration. Focuses include conditioning DOE spent fuel for long-term disposal through use of electrometallurgical processing, D&D of obsolete light-water reactors, advanced site characterization techniques, and biological remediation technologies.

- *National Security*

Arms control and nonproliferation technologies. Areas of emphasis are: (1) reduced enrichment fuel for research reactors throughout the world, and (2) systems for materials control and accountability.

- *Technology Evaluation*

Characterization and evaluation of nationally important projects and technology options in terms of their environmental, cost, or other implications. Major activities in this area include assessments of environmental regulations and policies, site-specific environmental impact and remediation studies, and evaluations of advanced energy technologies.

- *Education*

Enhancement of U.S. science and mathematics education through programs for students and teachers. Participation in Laboratory programs by university faculty and students brings their talents to bear on significant research problems and contributes to the education of future scientists and engineers. An important purpose of these programs is to encourage members of under-represented societal groups to enter careers in science and engineering.



Pervading all ANL-East missions is the transfer of technology, particularly through research & development (R&D) partnerships with industry and universities. These partnerships capitalize on the Laboratory's expertise and facilities. Principal mechanisms include cooperative R&D, use of major facilities, and work for non-DOE sponsors. The ARCH Development Corporation licenses technology and, where appropriate, organizes new firms.

An important Laboratory goal is excellence in protecting the environment and the health and safety of its workers and the public. In conducting all its missions, ANL-East's policy is that these considerations receive the highest priority in the Laboratory's operations.

The Laboratory conducts work for each of DOE's program secretarial offices. A large portion of its work is, however, concentrated in two areas: *basic energy sciences*, where the Advanced Photon Source and associated facilities are prominent, and *nuclear technology*. Basic energy science and nuclear technology constituted roughly half of all ANL-East research in 1996.

The Laboratory applies its special capabilities to perform research for federal agencies other than DOE, for nonfederal government agencies, and for private industry.

### 1.3 SOURCES OF ROUTINE WASTE GENERATION

Routine waste is generated through Laboratory funded R&D activities and Laboratory facility operations. The Laboratory's R&D activities generate wastes of different types as a function of the experimental design and the level of funding. Laboratory facility operations support the ANL-East's R&D efforts by modifying, developing, and maintaining facilities, treating and disposing of waste, and supporting research. Some operations-related waste streams, such as sanitary waste, fly ash from the boiler house, waste oil, etc., have been the primary targets for waste reduction throughout the early stages of ANL-East's Waste Minimization and Pollution Prevention Program because they represent the largest waste streams. This Plan distinguishes between "routine" and "nonroutine" waste based upon the source of the waste stream. Wastes generated by R&D activities and Laboratory facility operations in support of ANL-East's R&D efforts are considered "routine waste." Wastes generated by D&D, environmental restoration, facility restoration,<sup>4</sup> construction and demolition, and other unique nonroutine activities and projects are not considered "routine waste" for the purposes of this Plan and are not covered. Nonroutine waste generation will be covered on a project specific basis.

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<sup>4</sup>Facility restoration waste is defined as waste originating in experimental areas that: (1) are not subject to environmental restoration or D&D efforts, and (2) that contain experimental materials, equipment, hoods, benches, etc. that must be cleaned and disposed.

## 1.4 RADIOACTIVE WASTE GENERATION

Radioactive waste is generated by many divisions and programs at ANL-East. The recent upward trend in radioactive waste disposal results from the Laboratory's efforts in repackaging and shipping a large backlog of stored historical radioactive waste that had accumulated since 1988. This trend has also been impacted by many programs cleaning out radioactively contaminated equipment and materials that are no longer considered essential for ongoing work. Original radioactive waste generation volumes submitted for pollution prevention assessment only considered the quantity of radioactive waste disposed. The volumes did not take into account the historical backlog of radioactive waste in inventory. This method of determining the generation of radioactive waste penalizes ANL-East for processing and disposing of its historical radioactive waste backlog, while contractual performance measures require its elimination. The Laboratory will continue to dispose of large quantities of radioactive waste through 1998. During 1996, R&D activities contributed less than 200 cubic meters to the total quantity of radioactive waste generated.

When R&D generated radioactive waste data is examined over a multi-year period, low-level waste (LLW) generation practices show two trends: (1) the largest generators are involved in facility restoration, i.e., programs are removing, replacing, and decontaminating equipment because of experimental or programmatic changes, and (2) the radioactive waste generation rate averaged over the total population of waste generators is three cubic meters annually. One or two waste generators will each average 20 cubic meters annually, while the majority will be much lower than this. Programs, taken individually, tend to have a general cleanup of waste (about 20 cubic meters), followed by long periods of very low activity where they generate much less.

## 1.5 MIXED WASTE

Routine mixed waste generation from normal laboratory operations has trended downward significantly. This is attributed to eliminating hazardous scintillation cocktail fluids and source reduction practices in individual programs. Mixed waste generation will increase slightly in future years as the sludge is cleaned from wastewater retention tanks and the Electro Refiner project winds down. (The Electro Refiner project uses a cadmium salt matrix to refine components of reactor fuel.) R&D activities tend to generate relatively small quantities of mixed waste, primarily corrosive liquids, and materials, such as chromium, cadmium, and lead, that are radioactively contaminated.

## 1.6 HAZARDOUS WASTE

For the pollution prevention goals, DOE has chosen to combine RCRA-regulated waste and state-regulated waste under the category of hazardous waste. For ANL-East, state-regulated waste is regulated by the State of Illinois as Special Waste (special waste means any hazardous waste, and any industrial process waste or pollution control waste that has not been declassified pursuant to Section 808.245 of the Illinois Administrative Code [35 IAC 808.110]). ANL-East has three sources of waste in the special waste category: (1) fly ash, spent sorbent, and other sludge from operational activities, (2) R&D activities, and (3) D&D, environmental and facility restoration, and other “nonroutine” waste generating activities. For these three sources, boiler house operations are currently the dominant special waste generator.

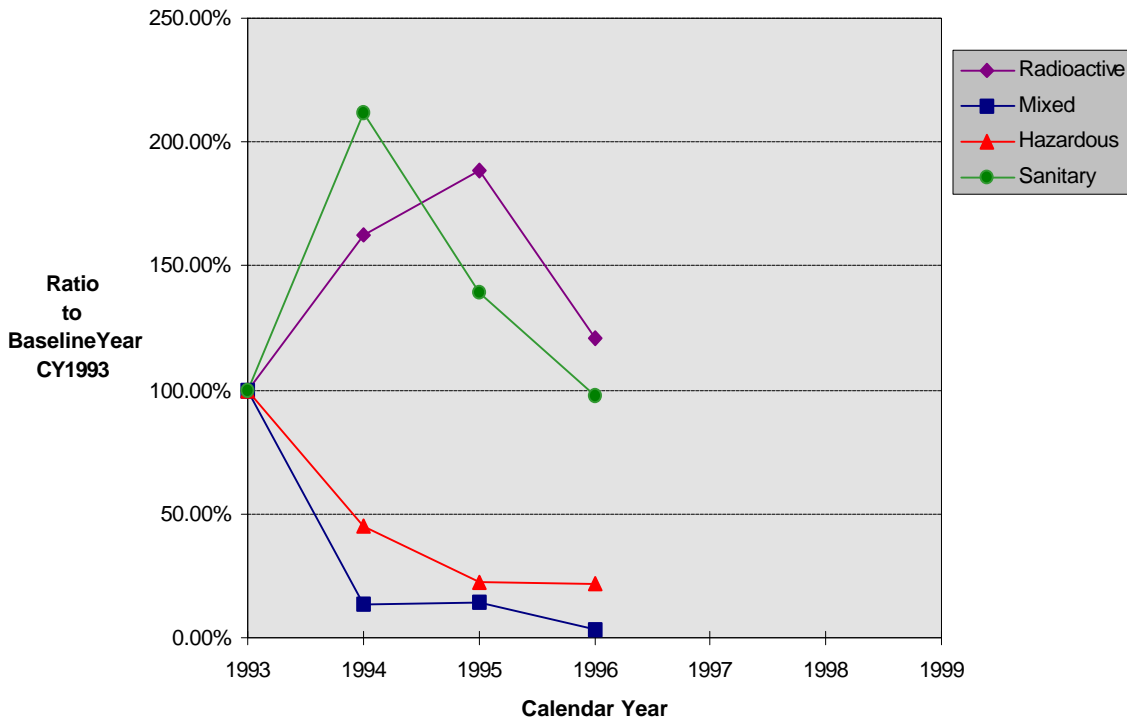
Hazardous waste has been reduced by eliminating the use of high sulfur coal at the boiler house. The high sulfur coal scrubber was a generator of state-regulated special waste. There will be an upward trend in hazardous waste (state-regulated) generation beginning in 1997 due to the two new wastewater treatment plants coming on-line. It is expected that these two new treatment plants will generate only 60% of the current special waste stream and will not impact the achievement of this goal.

The Laboratory has investigated hazardous chemical waste coming from R&D waste streams in recent years. The largest generators are limited to a few solvents (methanol and ethanol) that originate from a few individual programs. Typical programs generate very small (less than 20 liters per year) quantities of solvents. For instance, there are 31 generators of ethanol waste, but only half of them generate more than 20 liters of ethanol waste annually. Also, the site uses about 30 different solvents, most of which are used in quantities less than 20 liters per year total.

## 1.7 SANITARY WASTE

Sanitary waste, or nonhazardous general refuse, originates from most building locations at the Laboratory. The sanitary waste stream consists of a variety of waste materials, ranging from food waste from the cafeteria; glass, plastics, or metal waste from research or operations activities; bathroom waste from custodial activities; or paper waste from administrative activities. In the past, the Laboratory has conducted several sanitary waste assessments. These assessments have shown that the sanitary waste stream contains between 45% and 60% paper material (e.g., cardboard, colored paper, magazines, catalogs, newspapers, etc.). In 1996, the Laboratory developed and implemented the Mixed Office Paper Pilot (MOPP) Program to divert this large volume of material from the sanitary waste stream. The MOPP Program is estimated to divert and recycle more than one million pounds of paper material from the sanitary waste stream annually.

See Figure 1.



**FIGURE 1 Annual Waste Generation by Calendar Year**

## 1.8 NONROUTINE WASTE

Environmental restoration and D&D projects have generated large quantities of waste at ANL-East. The waste varies from project to project and the quantities are very dependent upon the specific activity that is being undertaken during any one period. However, these projects have been large contributors to mixed waste (primarily sludge and contaminated lead), radioactive waste, and special waste generation rates at ANL-East. This should be viewed as a positive, because these legacy materials are being removed, managed, and properly disposed. This reduces the overall hazard level at ANL-East and will reduce the amount of wastes generated in the future due to commingling and cross-contamination.

## 2 GOALS

The Secretary of Energy has defined specific programmatic pollution prevention goals and activities to be achieved by DOE before December 31, 1999. ANL-East subscribes to these goals and the activities outlined in the Pollution Prevention Program Plan of 1996. This Plan outlines steps that the Laboratory will undertake to achieve these goals. The goals are based on newly generated waste (exclusive of D&D and environmental remediation waste) using waste generated during CY93 as the baseline. Current waste generation data is based on the quantity of waste shipped from the ANL-East site. The specific activities that will be undertaken to achieve each goal are described here and in the appropriate Programmatic Activities section.

Goal 1. Reduce by 50 percent the generation of radioactive waste.

### Annual Radioactive Waste Generation (Cubic Meters)

	1993	1994	1995	1996	1997	1998	1999
Generation	294	478	554	355			
Goal							147

The goal for radioactive waste is ambitious considering generation volumes have been rising in recent years. This trend is attributed to the storing, processing, shipping, and disposal of historical waste accumulated between 1988 and 1992, when the Laboratory was without a designated low-level radioactive waste disposal facility, and to research activities nearing completion generating large quantities of radioactive waste from their project closeout. The strategy for achieving this goal is to continue the shipment and disposal of historical low-level radioactive waste while incorporating the use of volume reduction techniques, i.e., incineration, shredding, and direct compaction. The Laboratory will also emphasize its focus on segregating routine LLW from nonroutine LLW generated from D&D, environmental restoration, and large laboratory cleanout projects. This will allow the Laboratory to better quantify the amount of routine LLW generated annually. In addition to these strategies, the Laboratory will step up its efforts to identify materials which, when sufficiently decontaminated, can be disposed as nonregulated waste or "free released" for recycling or reuse.

This goal can be achieved through the implementation of the strategies discussed above.

Goal 2. Reduce by 50 percent the generation of radioactive mixed waste.

**Annual Radioactive Mixed Waste Generation  
(Cubic Meters)**

	1993	1994	1995	1996	1997	1998	1999
Generation	142.5	19	20	4.5			
Goal							71

The mixed waste goal will be achieved through a combination of treatment and source reduction. The Laboratory has implemented methods that substitute hazardous solvents with acceptable nonhazardous solvents in most scintillation cocktails, resulting in a significant reduction in the generation of flammable mixed wastes. Waste generators currently segregate mixed waste from the low-level radioactive and hazardous waste stream. This practice is encouraged and will continue to be promoted in the future. One treatment technique established by the Laboratory is a CO<sub>2</sub> pellet blasting system to clean and decontaminate lead bricks. Through this process, the lead bricks are decontaminated and then recycled or reused. Although decontamination costs may not compete with direct disposal, the technique will continue to be used in an effort to develop a more efficient and cost-effective alternative to disposal. In addition to this treatment process, the Laboratory has developed a number of treatment systems that should drastically reduce the disposal of mixed waste from the Laboratory by 1999.

This goal should be achieved through the continued execution and improvement of current activities and the implementation of planned activities.

Goal 3. Reduce by 50 percent the generation of hazardous waste.

**Annual Hazardous Waste Generation  
(Metric Tons)**

	1993	1994	1995	1996	1997	1998	1999
Generation	5588	2509	1246	1226			
Goal							2794

Hazardous waste as defined by this goal consists of RCRA-regulated waste and state-regulated special waste. Therefore, the “hazardous waste” stream contains two distinct and, in most instances, unrelated waste types. RCRA-regulated hazardous waste is generated primarily from multiple operations and research related activities. State-regulated special waste is generated from only a few Laboratory operations facilities, i.e., the boiler house and the two wastewater treatment plants. The Laboratory generates a larger volume of state-regulated waste than RCRA-regulated waste. However, the annual costs for managing and disposing of RCRA-regulated waste is more than that of the state-regulated waste.

Consequently, the Laboratory has developed a strategy that focuses on reducing the volume of both state-regulated and RCRA-regulated wastes. By reducing the volume of both waste types the Laboratory will achieve its volume reducing goal for 1999, while optimizing its cost savings potential.

The Laboratory can achieve this goal by successfully identifying and implementing alternative uses for the state-regulated waste streams, i.e., sorbent, lime sludge, fly ash, coal fines, etc. Also, the Laboratory will reduce the volume of RCRA-regulated waste by implementing more efficient packaging procedures for waste chemicals, developing and implementing treatment procedures for suitable waste chemicals, and developing and implementing a Surplus Chemical Inventory program that promotes the exchange and reuse of suitable chemicals that ordinarily would have been disposed.

Goal 4. Reduce by 33 percent the generation of sanitary waste.

**Annual Sanitary Waste Generation  
(Metric Tons)**

	1993	1994	1995	1996	1997	1998	1999
Generation	1260	2670	1753	1228			
Goal							832

The Laboratory has developed and is implementing aggressive recycling programs that will be used to achieve this goal. The Laboratory’s existing recycling programs focus on the collection of materials such as scrap metal, toner cartridges, wooden pallets, and mixed office paper. These programs will continue to be improved in an effort to divert as much material as possible from the sanitary waste stream. For example, due to the findings of several studies conducted from 1993 through 1996, which showed that the sanitary waste stream contains between 50% and 60% fiber (paper, newspaper, mixed paper, and cardboard), the Laboratory developed and implemented the

MOPP Program in 1996. The MOPP Program is designed to aggressively divert and recycle the large percentage of paper material from the sanitary waste stream. The Laboratory will continuously improve upon its existing recycling programs, as it has with the MOPP Program.

The Laboratory will continue to assess the components of the sanitary waste stream in an effort to identify components that can be diverted and recycled economically in the future. In addition, the Laboratory will work closely with existing waste and recycled material vendors to benefit from the capabilities and expertise each vendor can provide.

This goal should be achieved through the continued assessment, modification, and implementation of the Laboratory's existing recycling programs.

Goal 5. Reduce by 50 percent total releases and off-site transfers for treatment and disposal of toxic chemicals.

**Annual Toxic Release Inventory  
(Metric Tons)**

	1993	1994	1995	1996	1997	1998	1999
Treatment or Disposal	1.78	0	0	0			
Goal							0.89

ANL-East reported seven chemicals under the Emergency Planning and the Community Right to Know Act (EPCRA) (SARA 313) program in 1993. Following that submission in 1993, the Laboratory learned that six of the chemicals are not subject to reporting requirements under EPCRA because toxic chemicals used for maintaining motor vehicles (including fuels) are exempt from reporting. The last chemical, sulfuric acid, is no longer subject to reporting unless used as an aerosol, mist, or vapor form. It should be noted that sulfuric acid emissions were reduced at ANL-East by 50% prior to the Environmental Protection Agency (EPA) exempting it from reporting.

In the foreseeable future, the Laboratory will be reporting only on hazardous materials being removed from service and replaced by materials that are less hazardous. To date, all of the materials removed from service have been recycled, not treated or disposed; therefore, the Laboratory considers this goal as having been met.



Goal 6. Recycle 33 percent of sanitary waste from all operations, including cleanup and stabilization activities.

The Laboratory has implemented aggressive recycling programs for sanitary waste, and materials and chemicals originating from environmental restoration, D&D, and facility restoration activities. The programs have been successful in recycling shield blocks, chlorofluorocarbons (CFCs), coolants, roadway materials, and scrap metal from routine and nonroutine activities. The Laboratory will continue to work within each of these areas to develop, implement, and document waste stream diversion, material recycling, and other pollution prevention initiatives. In addition, the Laboratory will continue to identify additional areas of activity where waste minimization and pollution prevention (WM&PP) initiatives and programs can be developed and implemented.

Goal 7. Affirmative Procurement: Increase procurement of EPA-designated, recycled products to 100 %, except where they are not commercially available competitively at a reasonable price or do not meet performance standards.

The Laboratory is developing this program in the procurement area. The following activities have been successful:

- Facilities Engineering routinely specifies concrete with fly ash as a filler material.
- Custodial services identified 100% recycled products for use in their operations and began the transition process in 1993. They have completed this transition process.

This goal will be difficult to achieve laboratory-wide, because there are many small items purchased by individuals through supply houses (office materials are the best example). The documentation of these small and numerous items, made from recycled material, presents logistical difficulties, along with additional expenses, and is probably not administratively cost-effective however worthy. The Laboratory is working toward this goal through a combination of an Affirmative Procurement Awareness Program, the development of an upgraded procurement tracking system, and the development and execution of Laboratory-wide recycled product procurement procedures. However, barriers to documenting a 100% compliance factor impede progress toward the completion of this goal and is probably not time well spent.

See Table 1.

**TABLE 1 Pollution Prevention Waste Reduction Goals**

Cat.	Goal	1993 (Baseline) <sup>a</sup>	Projected 1997 Goals		Projected 1998 Goals		Projected 1999 Goals		By 12-31-99
		Quantity	Quantity	% Reduction	Quantity	% Reduction	Quantity	% Reduction	DOE Reduction Goals
Routine Operations	Reduction of Toxic Chemical Release Inventory	1.78	.89	50%	.89	50%	0.889	50%	50%
	Reduction of Low-Level Radioactive Waste Generation	294	700	(138%)	600	(104%)	147	50%	50%
	Reduction of Low-Level Mixed Waste Generation	142.5	56	60%	50	64%	50	64%	50%
	Reduction of Hazardous Waste Generation	5588	2000	64%	2000	64%	2794	50%	50%
	Reduction of Sanitary Waste Generation	1260	1200	5%	1000	20%	832	33%	33%
All Operations	Increased Sanitary Waste Recycling			33%		33%		33%	33%
	$\% = \frac{\text{Recycled Amounts}}{\text{San. Waste} + \text{Recycled}}$								
	Increased Affirmative Procurement of EPA Designated Recycled Products			20%		40%		50%	100%

<sup>a</sup> From 1994 Annual Report on Waste Generation and Pollution Prevention Progress, radioactive and mixed waste are in cubic meters, hazardous sanitary and recycled are in metric tons.

### 3 PROGRAMMATIC ACTIVITIES

In addition to the DOE Secretary's Pollution Prevention Goals, the DOE Pollution Prevention Plan of 1996 outlines 18 activities to achieve a successful pollution prevention program within DOE. This chapter will discuss adapting those departmental activities to the site level. The Laboratory will use those activities as the foundation for a much more comprehensive effort to develop industrial ecology and pollution prevention into environmental enhancement and waste prevention. The concept of waste prevention and environmental enhancement requires constant improvement beyond standard performance. The benefits of this approach are:

- Waste will be continuously reduced even after the current goals are achieved.
- Environmental enhancement brings with it a positive relationship with the community and outside regulators that will develop into a relationship of trust and mutual understanding.
- Achieving these objectives can lead to a reduced role for oversight and reporting, resulting in more resources being available for ANL-East's primary mission of R&D.

This plan will focus on two long range objectives:

- The Laboratory's present and future activities should be model programs that operate the facility and conduct R&D in a way that generates minimal waste and enhances the local environment.
- The Laboratory's R&D activities should create new technologies and products that are in conformance with the ideas of industrial ecology, waste prevention, and environmental enhancement on a national or global scale.

The DOE pollution prevention activities have been grouped into three categories and listed as near, mid, and long term activities. The activities have been broken down into the work breakdown structure developed by DOE in the Pollution Prevention Program Plan of 1996.

**Activities Required to Meet Secretarial Goals**

The Laboratory will meet the Secretary's Pollution Prevention Goals using three basic strategies: (1) maximizing recycling and beneficial reuse of materials where applicable, (2) a combination of source reduction, substitution, volume reduction, and on-site treatment for a number of waste streams, and (3) implementing training and awareness programs for the general Laboratory population.

The Laboratory's strategy for achieving the radioactive waste reduction goal is to continue the shipment and disposal of historical low-level radioactive waste while incorporating the use of volume reduction techniques, i.e., incineration, shredding, and direct compaction. The depletion of historical LLW, coupled with the implementation of the above-mentioned techniques, should reduce the amount of LLW generated by 1999 to within the Secretary of Energy's goal. The Laboratory will also focus on segregating routine LLW from nonroutine LLW generated from D&D, environmental restoration, and large laboratory cleanout projects, in an effort to better quantify the amount of routine LLW generated annually. Besides these strategies, the Laboratory will step up efforts to identify materials which, when sufficiently decontaminated, can be disposed as nonregulated waste or "free released" for recycling or reuse. The Laboratory will enhance and promote these techniques and strategies by providing personnel with informational programs using all means of communication at the Laboratory.

The Laboratory's strategy for achieving the goal of 50% reduction of mixed waste by 1999 is comprised primarily of two components: (1) treatment, and (2) source reduction. One treatment technique established by the Laboratory is a CO<sub>2</sub> blasting system to clean and decontaminate lead bricks. Through this process, the lead bricks are decontaminated and then recycled or reused. Although decontamination costs may not compete with direct disposal, the technique will continue to be used in an effort to develop a more efficient and cost-effective alternative to disposal. Besides this treatment process, the Laboratory has developed, and is making operational, a number of treatment systems that will drastically reduce the disposal of mixed waste from ANL-East by 1999. Examples of treatment methods include the neutralization of corrosives, the treatment of radioactively-contaminated reactive alkali metal, and reusing the byproducts of the alkali metal passivation booth to treat acidic wastewater.

The Laboratory has developed and is implementing mixed waste source reduction initiatives. Examples of these source reduction initiatives are: Laboratory personnel substitute hazardous solvents with acceptable nonhazardous solvents in most scintillation cocktails, resulting in a significant reduction in the generation of flammable mixed wastes. Waste generators currently segregate mixed waste from the low-level radioactive and hazardous waste stream. This practice is encouraged and will continue to be promoted in the future. The Laboratory has also initiated a program for cleaning retention tanks to eliminate potential sources of mixed waste contamination.

The Laboratory will enhance and promote these techniques and strategies by providing personnel with informational programs using all means of communication at the Laboratory. This goal should be achieved through the continued execution and improvement of current activities and the implementation of planned activities.

The Laboratory's strategy to reduce the amount of hazardous waste generated annually by 50% focuses on reducing the volume of both state-regulated and RCRA-regulated wastes. By reducing the volume of both waste types the Laboratory will achieve its hazardous waste goal for 1999, while optimizing its cost savings potential. The Laboratory boiler house, sanitary wastewater treatment plant, and laboratory wastewater treatment plant generate fly ash, coal fines, spent sorbent, wastewater sludge, and lime sludge that are regulated as special waste. The Laboratory will investigate cost-effective alternatives for the disposal of these waste materials and identify opportunities to reduce the volumes of these waste streams. The largest source of state-regulated special waste on-site (spent sorbent from the boiler house) has been eliminated through the implementation of alternative operations procedures at the Laboratory's boiler house. In the future, the Laboratory is investigating alternative uses for fly ash from the boiler house, as well as wastewater sludge and depleted filter sand from the sanitary treatment plant.

It is important to note that the Laboratory will commission new Laboratory and sanitary wastewater treatment plants in 1997. Many pollution prevention features were planned into the design of these facilities; however, the waste generated by these plants is currently not in the 1993 baseline. (The previous facilities used settling ponds that did not treat the waste stream, and therefore, did not generate large quantities of waste.)

The Laboratory will reduce the volume of RCRA-regulated waste by implementing more efficient packaging procedures for waste chemicals, by developing and implementing treatment procedures for suitable waste chemicals (such as corrosives for neutralization), source segregation, and by developing and implementing a Surplus Chemical Inventory program that promotes the exchange and reuse of suitable chemicals that ordinarily would have been disposed.

The Laboratory will enhance and promote these techniques and strategies by providing personnel with informational programs utilizing all means of communication at the Laboratory. This goal should be achieved through the continued execution and improvement of current activities and the implementation of planned activities.

The sanitary waste reduction goal will be met through a strategy that emphasizes source reduction and recycling initiatives. ANL-East has developed and is implementing aggressive recycling programs that will be used to achieve this goal. The existing Laboratory recycling program's focus is on the collection of materials such as scrap metal, toner cartridges, wooden pallets, and mixed office paper. These programs will continue to be improved in an effort to divert as much material as possible from the sanitary waste stream. For example, due to the findings of

several studies conducted from 1993 through 1996, which indicated that the sanitary waste stream contains 50% to 60% fiber (paper, newspaper, mixed paper, and cardboard), the Laboratory developed and implemented the MOPP Program in 1996. The MOPP Program is designed to aggressively divert and recycle the large percentage of paper material from the sanitary waste stream. The Laboratory will continuously improve upon the existing recycling programs, as it has with the MOPP Program. The Laboratory will also continue to assess the sanitary waste stream in an effort to identify components that can be diverted and recycled economically in the future.

The Laboratory is committed to giving personnel information and direction regarding existing and future methods to recycle and reduce potential waste materials. The inevitable evolution of existing recycling and source reduction programs ensures the importance of training and awareness opportunities. As the recycling programs mature, the emphasis on source reduction will increase. Future awareness programs will highlight the advantages of such activities as electronic communications, double sided copying, and reuse of discarded materials and equipment, etc.

The Laboratory will enhance and promote these techniques and strategies by giving personnel informational programs using all means of communication at the Laboratory. This goal should be achieved through the continued assessment, modification, and implementation of the Laboratory's existing recycling programs.

The recycling goal of 33% should be met by expanding the MOPP program and metals recycling efforts to include construction debris, fly ash, and coal fines. Chemical recycling will also contribute to this effort.

The toxic release inventory reduction goal has already been met. The effort will continue by replacing CFCs currently in use at several facilities and elimination of ethylene glycol coolant supplements where they are used. All of these materials will be recycled.

The procurement of recycled materials goal will be furthered by expanding current efforts. Use of recycled oil, tires, and other materials are being implemented. The most difficult recycled materials programs will be office paper supplies. This will be accomplished by awareness programs and establishment of specific procurement limitations.

## **Additional Good Management Practices**

The DOE Pollution Prevention Plan of 1996 identified 18 activities in the format of a work breakdown structure that sites could use as a guide when developing a compliant pollution prevention program. ANL-East's program is developed around this structure. A discussion of these 18 activities follows.

### **3.1A Near Term: Establish Goals to Minimize Waste Generation and Environmental Releases**

The Laboratory first established pollution prevention goals in the 1994 Pollution Prevention Awareness Plan. The DOE-University of Chicago contract for management of ANL-East incorporated pollution prevention goals in 1995. In addition, the Laboratory is committed to achieving the DOE pollution prevention goals established by the Secretary of Energy in 1996. This Plan expands upon the original pollution prevention goals established in 1994 and 1995, and specifically addresses the DOE Pollution Prevention Goals of 1996.

The long term objective of the program will be the systematic elimination of all waste streams in a manner compatible with the current laboratory mission. While this objective may not be achievable, the idea of zero waste generation is a worthwhile effort that will require constant attention, challenge, and improvement. The fact that waste generation is always challenged will provide a continuing cycle of improvement.

### **3.1B Near Term: Establish Senior Management Commitment and Follow-Through for DOE Pollution Prevention Activities**

ANL-East has recognized the importance of senior management commitment and support for the pollution prevention program. The current program has shown senior management's commitment to pollution prevention by the following actions:

- Approval of this Plan by senior Laboratory management,
- Establishment of the Waste Minimization and Pollution Prevention Advisory Committee, reporting to the Chief Operations Officer. This committee coordinates sitewide awareness activities, investigates and develops WM&PP programs and initiatives, and provides assistance and direction to Laboratory management and personnel,
- Approval of the ANL-East Waste Minimization and Pollution Prevention Strategic Plan and Annual Implementation Plans, and

- Allocation of funds to support pollution prevention projects, such as the MOPP program, oil water filter at central shops, and replacement of vapor (trichloroethylene) degreaser with an aqueous degreaser, among others.

The level of senior management commitment has grown continuously since the program's inception in 1992. The pollution prevention program benefits from management interest and support as evidenced by funding commitments from laboratory overhead accounts, and the "hands-on" participation of managers in WM&PP activities throughout the year.

Environmental enhancement will convey the senior management commitment down to the division director and group leader levels where the motive for implementation will change from that of compliance and direction to one of resource conservation. Implementation will become a matter of doing business. Philosophically, the program will function from a business perspective, not from a compliance perspective.

### **3.1C Mid Term: Distinguish Pollution Prevention Budget Allocations through Activity Data Sheets**

The pollution prevention budget process has been relegated to one Activity Data Sheet (ADS) managed by DOE-CH and several unfunded ADSs submitted with the Environment, Safety, and Health (ES&H) Five Year Plan annually. The budget process has been hard to understand because Environmental Management Operations (EMO) pays for certain portions of the program, but not all portions. Waste generators and the landlord organization (Energy Research) are responsible for other portions of the program. DOE has delineated the funding responsibilities; however, conflicting priorities and incentives have confused this issue, resulting in a program that is constantly under funded.

In Chapter 4, Resource Requirements, this Plan identifies requested funding levels for the next two fiscal years.

Individual waste generators are encouraged to request funding for specific waste prevention projects through their specific funding organization. Development of budgets, ADSs, and supporting documentation for sitewide programs and activities is the responsibility of EMO and is budgeted accordingly.



**3.1D Long Term: Promote Regulatory Review and Technical Assistance**

ANL-East has been recognized by the Illinois EPA for its pollution prevention program. The Illinois Department of Natural Resources and DOE have recognized individual portions of ANL-East's pollution prevention program. The program has been complimented in assessments conducted by Region V, U.S. EPA. The present ANL-East program is in compliance with requirements and has been recognized by its regulators as an exemplary facility.

The long term benefit of environmental enhancement will be realized when regulators recognize the Laboratory has gone beyond the intent of regulations, and naturally turn to ANL-East for technical assistance, review, and council. The anticipated outcome is a diminished role for compliance oversight and reporting, followed by greater latitude implementing waste prevention measures.

**3.1E Long Term: Consistent DOE Policies and Procedures to Integrate Pollution Prevention**

Consistent policies and procedures are essential to pollution prevention. ANL-East will work with DOE to develop ideas and concepts that can facilitate "reinventing government" to achieve common goals and objectives.

**3.2A Near Term: Establish Clear and Accountable Performance Measures**

The University of Chicago-Argonne National Laboratory contract with DOE established pollution prevention contract performance measures in 1995. The original contract performance measures focused on reduction of hazardous and sanitary waste. These goals were similar to the Secretary's goals. The two measures achieved an outstanding rating during the first contract year.

During the second contract period (FY97), the contract performance measures have been adapted to a single measure that reflects the Secretary's pollution prevention goals:

**MEASURE (Success Indicator) 1:** Support of DOE pollution prevention goals.

**EXPECTATION (Measure) 1:** Completion of the following tasks: (EH8)

1. Provide a current status of progress toward each goal using the CY93 as the baseline.
2. Complete and implement an Annual Waste Minimization and Pollution Prevention Plan for ANL-East.

3. During FY97, show improvement in reducing the waste generation rates for the waste streams identified in the overall U.S. DOE's pollution prevention goals.
4. During FY97, show improvement in diverting for recycling solid, nonhazardous wastes from all operations in accordance with the overall U.S. DOE's pollution prevention goals.

The Laboratory anticipates that there will be contract performance measures in place at least through the December 1999 period specified by the Secretary's goals. Beyond the year 2000 it is anticipated that environmental enhancement will be recognized as a positive factor in laboratory operations and the appropriate performance incentives will be in place.

### **3.2B Near Term: Analyze Pollution Prevention Costs and Benefits for use in Decision Making**

The Laboratory has historically used two methods of project evaluation successfully. Construction projects typically undergo a value engineering review during the Title I and Title II design phase. This process has been very effective at revealing improvements at the design stage. This process will continue to be used. Engineering groups are beginning to use additional tools such as guides that incorporate pollution prevention into the design and specification process that provide design for environmental concepts. The use of these tools is being encouraged and expanded.

Additionally, the Laboratory has begun to use benchmarking practices to identify better methods of operation. In 1996, the Laboratory worked with Northern Illinois University and Illinois State University to benchmark vehicle maintenance and grounds activities. The Laboratory is working with Brookhaven National Laboratory and Princeton Plasma Physics Laboratory to benchmark hazardous waste operations in 1997. The plan is to use benchmarking to gain knowledge from other sources to improve ANL-East operations.

The Laboratory has used the process of Pollution Prevention Opportunity Assessments (PPOAs) as a tool to identify cost-effective methods of waste reduction. This practice has been particularly helpful in the EMO area of responsibility.

There are a number of PPOAs that need to be completed and implemented to maximize waste reduction in the current program:

- Packaging of low-level radioactive waste,
- High pressure liquid chromatograph solvent recycle,

- HEPA filter use and replacement of ductwork and filters,
- Control of copper input to the laboratory wastewater treatment plant, and
- Other PPOAs will be conducted and implemented as opportunities are identified.

### **3.2C Mid Term: Facilitate Pollution Prevention Technology Transfer and Information Exchange**

The Laboratory has developed and implemented several internal and external programs for information exchange and technology transfer:

- The Laboratory has a very effective technology transfer organization that works with industry to implement new technology in the private sector,
- The Laboratory pioneered the Airlie House Technology Transfer effort developed by DOE-CH. The program is currently working cooperatively with the Illinois EPA and other partners to expand micro scale chemistry education workshops to a wider audience, and
- The Laboratory has spearheaded environmental programs with the inner city communities of Chicago to develop brown fields into pollution prevention projects.

The ANL-East site has also worked to develop technology transfer and awareness to the on-site community by:

- The Woody Wastenot and MOPP poster programs, developing awareness and expanded recycling,
- ES&H training classes that address waste generation have always featured WM&PP concepts, and
- The Waste Minimization and Pollution Prevention Advisory Committee sponsored pollution prevention awareness sessions.

**3.2D Long Term: Develop a DOE Pollution Prevention Incentives Program**

Acknowledgment and recognition of achievement at the personal and program level are considered the highest forms of motivation. Environmental enhancement will be achieved by recognizing achievement in the areas of pollution prevention, waste prevention, and industrial ecology. ANL-East programs and activities have been recognized by the Governor of Illinois, the Illinois EPA, DOE-CH, and DOE-HQ. The Laboratory will develop a site specific award and recognition program.

**3.2E Near Term: Develop and Conduct Pollution Prevention Employee Training and Awareness Programs**

Awareness plays a critical role at a facility like ANL-East. The Laboratory has more than 1,000 waste generators (scientists and engineers), many capable of generating small quantities of waste. The program relies on the individual initiative and motivation of small waste generators incorporating WM&PP into their daily activities. To achieve environmental enhancement, all employees must understand ANL-East's pollution prevention vision and become willing participants in the process. This will be achieved by active and ongoing awareness programs.

**3.2F Long Term: Develop and Implement a Pollution Prevention Outreach and Public Involvement Program**

The Laboratory successfully developed the DOE-CH sponsored Airlie House Pollution Prevention Technology Transfer Program in 1994-1995. The program expanded to include outside participation in 1996, and will expand again in 1997. This program has three components: (1) teaching high school science programs the "how to's" of micro scale chemistry in order to expand the scientific literacy of our youth, (2) a cost benefit study and development of micro scale procedures for college chemistry (the second year of this program scheduled for 1995-1996 was not completed), and (3) an environmental training program with inner city programs. The results of the cost benefit study will be developed to expand micro chemistry education to include the college level experimental program and industrial ecology to a broad range of science programs.

ANL-East conducts biennial open houses to show our activities to the surrounding community. The 1996 50th Anniversary Open House hosted more than 24,000 guests.

The University of Chicago, with DOE-ARG, has hosted numerous Community Leaders Round Table meetings to inform the community about the site and to allow feedback. Pollution prevention has not been a featured part of the first round of Community Leaders Round Table meetings; however, it will be developed as an extension of the current program.

### **3.3A Short Term: Develop and Maintain Site Pollution Prevention Programs that Comply with Federal, State, and Departmental Directives**

#### **1. Organization and Infrastructure**

The organization and infrastructure for the ANL-East Pollution Prevention Program reside within Environmental Management Operations – Waste Management (EMO-WM). The pollution prevention staff reports to the Manager of Waste Management (WM). The Laboratory created the staff level positions beginning in 1992 and formally expanded permanent staff in 1995. DOE-ARG area office formally interacts with the Manager of WM.

The Laboratory initiated a Waste Minimization and Pollution Prevention Advisory Committee reporting to the Chief Operations Officer in 1995. This committee includes members of the scientific community, operations staff, and DOE. The committee meets monthly to implement the pollution prevention program and to facilitate sitewide awareness projects. This committee has also screened projects for the DOE awards program, participated in the Annual DOE Pollution Prevention Conference, and organized an Earth Day Program. The Waste Minimization and Pollution Prevention Advisory Committee is funded by a direct laboratory allocation from overhead accounts.

The ANL-East program will continue to be managed through EMO in the future. EMO will be responsible for the preparation of sitewide plans and budgets, infrastructure development, maintenance of program plans and documents, and preparation of annual reports. However, many of the activities identified in this Plan were developed to be accomplished with existing Laboratory resources.

#### **2. Program Development**

The Laboratory's Pollution Prevention Program is developed around the following documents:

- The Waste Minimization and Pollution Prevention Strategic Plan that defines the vision goals and objectives along with steps to attain that vision.
- This Pollution Prevention Plan.

- The annual Waste Minimization and Pollution Prevention Implementation Plan that sets annual goals and activities.
- A Current Year Work Plan for EM-77 Waste Minimization and Pollution Prevention funded work.

In addition, a pollution prevention clause was added to the Laboratory's overall Environmental Policy statement in 1995. Lastly, the ANL-East DOE contract served as one of the first performance based contracts incorporating pollution prevention performance measures in 1995-1996. The current contract has specific pollution prevention performance measures.

The program developed goals for the 1994 Pollution Prevention Awareness Plan. The ANL-East DOE contract served as one of the first performance based contracts incorporating pollution prevention performance measures in 1995-1996. The current contract has specific pollution prevention performance measures. This plan identifies specific pollution prevention goals in conformance with the Secretary's intentions.

### 3. Employee Involvement

Employee involvement has played and will continue to play a significant role in the Laboratory's efforts to achieve the Secretary's goals. The ANL-East program has used training, awareness, recognition, and publications in the past. These activities will be expanded by:

- Developing modules for general employee training, visitor entrance, and hazardous and radworker training programs. Each module will emphasize what individuals can do to make the program successful.
- Using poster programs to increase paper recycling efforts and involve site personnel. This is an effective method to communicate broad ideas and will be continued in the future. The emphasis will be placed upon actions that individuals can do to help the effort.
- The Laboratory has pioneered the *Waste Line*, a site newsletter dedicated to waste related topics. Continued emphasis will be placed on waste prevention and environmental enhancement activities as a form of communicating program successes.

- All Laboratory personnel are evaluated on ES&H practices that include a number of factors. Pollution prevention will be added to the list of items in this category.

#### 4. Tracking

WM has developed an effective waste tracking system for radioactive, hazardous, and chemical wastes. WM personnel will be expanding the system's capabilities to include all regulated waste and most recyclables leaving the site.

#### 5. Reporting

The waste tracking system provides all of the compliance reports except the SARA 313 report, which is produced by ES&H. The DOE required Waste Generation Report, and numerous reports and data requests, are developed from the waste tracking system. The reporting system has also been used to identify problematic areas.

#### 6. Sitewide Waste Reduction

Waste reduction activities are broadly organized into source reduction, toxics release inventory reduction, and recycling and reuse. The ANL-East Plant Facilities and Services, Facilities Group, is actively exchanging toxic materials used in daily operations with less toxic materials.

The following additional activities are planned in each area:

##### **Source Reduction**

- WM has begun shredding and compacting LLW. This will reduce disposal volumes of waste significantly. Shredding reduces the volume of HEPA filters shipped for disposal by a factor of at least four. Compacting reduces waste disposal by a factor of two to four. The Laboratory is investigating the use of a supercompactor to achieve a further volume reduction of two to four. Additionally, commercial incineration services will be used, where cost effective, to reduce disposal volumes.
- WM also decontaminates materials for free release such as during small scale D&D projects.

- WM can decrease disposal volumes 25% by making more effective use of waste containers and reducing the use of plywood bin liners, where applicable.
- Many Laboratory programs are currently reviewing material, equipment, and chemicals they have been using, or have in storage, while conducting radioactive research activities. The intent of these programs is to dispose of material and equipment that is no longer used or may be considered obsolete. Cleanouts of this type generate larger quantities of waste than normal R&D by a factor of between 2 and 20. An effective cleanup campaign will eliminate this excess material with the following benefits: (1) radioactive material will be removed, eliminating the material, (2) a source of contamination will be removed, (3) excess material will not have a tendency to become orphaned by long term neglect. Given sufficient pollution prevention funding, a sitewide cleanup of radioactive material will be planned for FY98-99.
- Reducing the square footage of controlled areas, thereby reducing contaminated area and potential for contamination.
- Funding to support a general laboratory cleanup program in FY98-99. Funding will be required for characterization, processing, packaging, shipping, and final treatment and disposal.
- Acid and caustic wastes will be used to neutralize other wastes originating from alkali metal passivation, mixed waste treatment, and other laboratory operations.
- The Laboratory is demonstrating a technology process to purify and return research grade solvents for use. This process will be implemented where effective.
- The limiting condition for operation for the laboratory wastewater treatment plant will be removal of copper to meet NPDES permit requirements. A large contribution to the copper in wastewater treatment plant influent is copper that is being eroded from cooling coils on condensers and heat transfer equipment. Flow control devices have the potential of reducing erosion and copper input while decreasing maintenance load. A study will be conducted to review, make recommendations, and implement changes, if warranted.



## **Toxics Reduction**

The Laboratory is phasing out and replacing toxic chemicals in CFC and component chiller systems. These programs are funded by Energy Research and Laboratory overhead.

## **Recycling and Reuse**

- Development of a chemical storeroom system to facilitate collection and redistribution of unused and excess chemicals is being developed to reduce chemical disposal costs. This will be used in conjunction with the chemical inventory program. This has the potential of reducing expensive research generated waste by 10-25% annually, with the added benefit of reducing orphaned materials.
- The Laboratory is studying methods of increasing recycle of fly ash and sanitary waste treatment plant sludge in an effort to reduce the total waste from this source.
- Implementation of the MOPP program to recycle all fiber-based material generated on-site (Goal 4).
- Increased recycling of metals and other materials generated on-site, and
- Increased pollution prevention activity in the D&D programs.

## **7. Technical Assistance**

The ANL-East Pollution Prevention Program has helped many on-site waste generators with particular problems. The program has conducted PPOAs with and for waste generators. Program personnel provide an informal consulting role to help formalize activities such as goal setting, opportunity assessment, waste characterization, and baseline and cost determination.

The program will continue to provide a role in developing programs and activities that reduce waste or help to meet other DOE pollution prevention objectives by working with waste generators and researchers to identify opportunities and potential solutions. The program serves as the site conscience in areas of environmental enhancement.

PPOAs frequently identify opportunities for additional R&D of new technology. This information is sent to interested research parties.

#### 8. Information and Technology Exchange

The ANL-East program has authored numerous papers on pollution prevention at many national and international meetings. Program personnel have organized sessions and conferences on pollution prevention, and prepared papers describing ANL-East work in this area. Program personnel will continue to provide a leadership role describing ANL-East activities at professional meetings.

Technology exchange and interchange will expand to include a prominent role for waste prevention and environmental enhancement at local community meetings. This will be done to show the positive impacts ANL-East has on the local community.

The Laboratory has contributed articles to the Pollution Prevention Clearinghouse (EPIC) and will continue to provide information to this media.

The Waste Minimization and Pollution Prevention Advisory Committee will conduct monthly meetings to coordinate sitewide activities and develop awareness sessions for the entire community.

The community outreach portion of the program will continue development on the Airlie House Micro Chemistry programs.

#### 9. Program Evaluation

The Laboratory prepares quarterly reports for DOE-ARG describing and documenting progress toward achieving programmatic goals. The quarterly reports describe progress on the Current Year Work Plan, and a report is prepared annually describing progress on Implementation Plan goals.

The Laboratory will continue quarterly reporting and expand the final report to describe annual accomplishments in detail. The report will become a report for DOE and ANL-East senior management focusing on the pollution prevention program.

### **3.3B Mid Term: Develop and Maintain Consistent Generator-Specific Programs**

Since January of 1995, the Laboratory has developed annual WM&PP Implementation Plans. The WM&PP Implementation Plan identifies sitewide WM&PP goals that relate directly to generator-specific activities or programs. These WM&PP goals incorporate the focus and direction provided by the ANL-East Waste Minimization and Pollution Prevention Strategic Plan (November 1995).

Many of the goals in the annual WM&PP Implementation Plan are derived from ANL-East's Current Year Work Plan for Waste Minimization and Pollution Prevention Project. The Current Year Work Plan for Waste Minimization and Pollution Prevention Project is funded through DOE (EM-77) and is managed by EMO-WM.

The function of EMO-WM, through the Current Year Work Plan, is to provide guidance and assistance to ANL-East divisions, groups, and personnel throughout the development and implementation of large and small scale WM&PP initiatives and programs. In the future, most of these WM&PP initiatives and programs are to be identified in the Annual WM&PP Implementation Plan and Current Year Work Plan for Waste Minimization and Pollution Prevention Project. WM&PP projects may be developed and initiated beyond the scope of these two documents as well.

It is important to note that the ANL-East Waste Minimization and Pollution Prevention Advisory Committee also provides guidance and support to EMO-WM, and ANL-East divisions, groups, and personnel throughout the development and implementation of WM&PP initiatives and programs. Additionally, many of the goals provided in the Annual WM&PP Implementation Plan are voluntarily owned and executed by ANL-East divisions, groups, and individual employees who are committed to supporting and fostering WM&PP initiatives at ANL-East. These independent efforts create the vital and dynamic environment needed to incorporate WM&PP strategies and philosophies throughout the ANL-East complex.

### **Organization and Infrastructure**

The ANL-East program and operating divisions and departments are organized such that at least one individual has a staff responsibility as the ES&H Coordinator. The ES&H Coordinator receives additional training in matters related to ES&H and has a responsibility for helping individuals with implementation within their divisions. The individuals also frequently function on division safety committees. These individuals form the core of the pollution prevention structure at the division, department, or program level.

The ES&H Coordinators are also invited to participate in pollution prevention awareness activities and functions sponsored by EMO or the Waste Minimization and Pollution Prevention Advisory Committee.

### **Facility Program Development**

Individual divisions, departments, programs, and facilities do not need to develop independent generator specific pollution prevention program plans provided they subscribe to this one. Individual divisions and programs are encouraged to develop their own pollution prevention goals and objectives and implement those goals and objectives by developing budgets and schedules. Individual programs should budget pollution prevention projects that are specific to their activities through their individual program office.

### **Sitewide Program Participation**

Employee awareness and information exchange play significant roles in the ANL-East program. General employee awareness is conducted by using posters and articles in the sitewide periodicals. Employees are also encouraged to take advantage of the DOE EPIC system by using the INTERNET. Development of a home page for the Pollution Prevention Program is underway.

EMO is available to provide technical assistance to solve difficult waste or recycling questions. They use their tracking and reporting system to evaluate waste generation practices and identify potential opportunities for waste reduction.

### **Facility Training**

Every ANL-East employee undergoes training specific to their job requirements. The pollution prevention program will add specific modules to sitewide training programs to provide job-specific training. Individuals from EMO are available to augment specific division level training programs. Training opportunities, such as PPOA training, are made available to other personnel when the opportunity arises.

### **Opportunity Assessments**

Individual organizations are encouraged to work with EMO to conduct PPOAs. This process is particularly adaptable to larger generators where the effort involved in assessment and

implementation can yield cost-effective results. EMO has conducted several successful PPOAs in the past. All of these assessments produced positive results.

### **Opportunity Implementation**

Opportunities to implement waste minimization, pollution prevention, or waste prevention frequently come as small individual steps that individual researchers can and do implement independently. Programs frequently implement waste saving practices without recognizing that the process is waste prevention. Individual programs are encouraged to continue these efforts and discuss them with EMO.

### **Design Considerations**

Laboratory operations groups are actively adding formal pollution prevention guidance to their informal practices. Vehicle Maintenance and Facilities Planning & Engineering are currently adding procedures that will implement pollution prevention. They are incorporating waste prevention and pollution prevention into the design of new facilities. As an example, the new sanitary and labwater treatment plants incorporated pollution prevention into their designs by using concentrated reagents that produce less total waste.

Research divisions conduct safety reviews of new experiments and activities before the start of those activities. This review considers waste generation. This program will be developed by providing additional training and awareness to the division ES&H personnel so that they can more effectively pursue pollution prevention, recognize waste prevention when it occurs, and provide input and an information exchange to the community about it.

### **Program Evaluation**

Program implementation will be conducted through the ES&H infrastructure of individual divisions and programs through their established channels of management and communication.

Evaluation of the effectiveness of individual programs and activities is conducted by EMO by reviewing waste generation practices and trends.

### **3.3C Short Term: Perform Opportunity Assessments and Implement Pollution Prevention Projects**

The Laboratory has conducted PPOAs and implemented the findings in a limited number of applications. The Laboratory will use essentially three processes to evaluate projects:

- Construction projects have been very successful using a value engineering approach to optimizing design, construction, and facility operation,
- Assessments of large individual waste streams or combinations of smaller streams will be done using the opportunity assessment process. Individual programmatic waste generators generally do not currently produce waste in large enough quantity to merit the disciplined review steps of a formal assessment, and
- Conducting benchmarking exercises to identify best-in-class operations and activities.

### **3.3D Short Term: Design Pollution Prevention into New Products, Processes, and Facilities**

This activity is being addressed in the following manner:

- The Facilities Engineering Group is reviewing the use of two products that incorporate WM&PP into the construction and modification process. They are reviewing *Waste SPEC*<sup>5</sup> and P2-EDGE<sup>6</sup> as potential enhancements to their programs.
- The Laboratory has been tracking and trending waste generation from construction and modification activities since 1995. Most construction contractors are active in some form of recycling and source separation activities as a normal function of their business. Successes in this area have not been well documented; however, they are occurring as a normal function of business.

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<sup>5</sup>WasteSpec, Model Specifications for Construction Waste Reduction, Reuse, and Recycling, Triangle J Council of Governments, Research Triangle, North Carolina, July, 1995.

<sup>6</sup>P2-EDGE Pollution Prevention Environmental Design Guide for Engineers, Version 2, Pacific Northwest National Laboratory, Richland, Washington, PNL-10632, Rev. 2 UC-602, 1996.

- The NEPA Environmental Notification Form is being reviewed and WM&PP concepts are being recommended for adaptation.

The Laboratory needs to develop in this area by documenting that effective waste reduction measures are incorporated into facility and project designs and implemented in the project construction. Environmental enhancement will carry this process to its fullest expectations: (1) construction and modification designs will feature waste and energy friendly concepts, (2) research programs will look to developing new products to satisfy pollution prevention needs of the nation. The Laboratory is currently developing analytical procedures for environmental sampling that incorporate WM&PP in the sampling and analysis phases, and (3) research programs will review their own activities to decide the best way of designing an experiment or demonstration, while incorporating pollution prevention concepts.

### **3.3E Long Term: Integrate Pollution Prevention Research, Development, Demonstration, Test, and Evaluation Programs**

Research divisions use the process of Safety Review to examine new experiments and development programs for a number of factors, among them waste generation. This practice is very helpful because it amounts to a peer review of individual projects. Peer review is the best method for incorporating pollution prevention into experimental practice because the reviewers are experts in the technology and understand the intricate nature of the technology. Research programs can be very difficult to review because the technical expertise often resides with individual researchers and their peers. The problem is compounded by the fact that the average researcher does not generate large quantities of waste. Detailed reviews by outside groups may not be cost effective for most programs due to the quantities involved. The long term goal of the program is to develop a culture that incorporates waste prevention in the thought process as an experiment is designed. This is far more effective than conducting individual assessments on small programs.

The ANL-East program will focus on awareness within the research community to develop a culture that works to avoid waste generation. Technology customers want products (technology) that do not generate waste. This culture needs to be incorporated into the technology development cycle. Professionals involved in waste minimization, pollution prevention, and recycling are always available to add expertise to difficult decision processes.

### **3.3F Long Term: Implement Environmentally Sound Pollution Prevention Procurement Practices**

The Laboratory has been successful at procuring some recycled materials such as fly ash, concrete, tires, and insulation. The program is currently receiving new emphasis in the construction areas. Construction managers are working to include these products where cost effective.

The vehicle maintenance areas are being encouraged to use recycled oil and tires.

A study is being conducted to identify copier paper that can be used in laser printers and copy machines. Custodial services led the way incorporating recycled products in all of their fiber uses.

The Laboratory will continue developing this program by emphasizing awareness for the general community, working with specific users of large volumes, and developing a program to highlight products with recycled content and document preferential purchases.

- Vehicle maintenance is reviewing the use of used oil and recapped tires. Programs in this area will begin in FY97.
- The Waste Minimization and Pollution Prevention Advisory Committee is conducting a study of copier paper to identify products with high recycled content. This study will make a recommendation in FY97.
- Procurement is actively encouraging their customers to buy recycled products, particularly in areas where large purchases occur.
- Procurement is developing a component of their ordering and tracking system to document procurement of recycled materials.

### **3.3G Mid Term: Reduce Releases of Toxic Chemicals (EPCRA 313 TRI)**

The Laboratory has initiated a program to replace CFCs and regulated coolants such as ethylene glycol coolant chemicals. The present ANL-East programs are recycling and eliminating chemicals subject to TRI reporting.

ANL-East programs will continue to eliminate sources of chemicals subject to reporting. The long range plan is design for the environment and eliminate the use of reportable chemicals in reportable quantities.



## 4 RESOURCE REQUIREMENTS

The costs for the pollution prevention program are funded by multiple sources. The infrastructure for the sitewide program and a portion of the sitewide activities are funded by EM-77. Energy Research provides project funding for such activities as replacement of CFCs. Laboratory overhead and discretionary funding have been used to fund other activities. Finally, generator organizations indirectly fund pollution prevention through salary and other commitments.

The Laboratory pollution prevention funding requirements have been formulated with the intention of providing sufficient funding to achieve the Secretary's Pollution Prevention Goals. The funding requirements and schedule are outlined in this Chapter.

DOE-CH has historically maintained one ADS for pollution prevention, and the Laboratory has been a part of that ADS. The funding for CFC replacement is requested through Energy Research.

Table 2 summarizes annual funding needs.

**TABLE 2 Expected Annual Resource Needs**

	Pollution Prevention Resource Requirements (in Thousands of dollars)		
	FY98	FY99	Total
EM-77 Programmatic Funding	380	700	1,080
Laboratory LLW Cleanout	300	300	600
Total	680	1,000	1,680